

Inventory of Butterflies at Mount Rushmore National Memorial



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Submitted to:

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EXECUTIVE SUMMARY

In May 2004 the author was contracted by the National Park Service to conduct a butterfly inventory of Mount Rushmore National Memorial (MRNM) located in the Black Hills of South Dakota. During the 2004 flight season butterfly surveys were conducted to document species diversity and abundance as well as determine the presence or absence of any “species of concern.”

Thirty-nine species were documented for MRNM. No federally listed butterfly “species of concern” were found.

INTRODUCTION AND METHODS

There are approximately 14,500 species of butterflies worldwide, with almost 700 of them occurring in the United States and Canada. One hundred seventy-seven species were reported for South Dakota in 2002, of which 127 are documented for Pennington County (Marrone, 2002).

Four sampling periods, late May, and mid June, mid July, and mid August, were selected for this project to maximize the number of butterfly species encountered as well as coincide with the flight periods of three species listed as “species of concern” by the U.S. Forest Service. A standardized data form was used to record butterfly species on each site. Information regarding number per species, sex, condition of individuals, nectar sources, and behavioral aspects was recorded. Additional data was also collected on temperature, time of day, habitat type(s), and weather conditions.

The census method known as a “checklist count”, as noted by Royer, *et al.* (1998), was used because of its effectiveness in confirming the presence of as many butterfly species as possible in a relative short period of time and effort. This casual or random technique for observing butterflies allows the surveyor to select likely concentration sites such as nectar sources, larval host sites, and potential habitat for specific species and avoid large areas with high densities of non-native plant species.

Baited butterfly traps, often referred to as *Agrias* traps due to their success in capturing that genus in tropical environments, were also used to sample butterfly species found in wooded areas. The trap design is similar to that sold by BioQuip Products, Gardena, CA. Each trap consists of a 36-inch high nylon mesh cylinder with 15-inch diameter metal rings at top and bottom. The top is covered with heavy-duty cloth. A 3.5-inch mesh trap lip attached at the bottom to an inner metal ring provides an eight-inch opening. A 16-inch square plywood base supports the bait container and provides a landing platform for incoming butterflies. The platform is attached to the cylinder with nylon cord that allows an entry opening of approximately two inches in height. Traps were suspended from large cottonwood, aspen, or ponderosa pine trees approximately five feet above ground level. Bait used was a mixture of molasses, apple cider, brown sugar, stale beer, and ripened bananas.

Common and scientific names of butterflies used in this report follow the book, *Field Guide to South Dakota Butterflies* by this author. Common names of plants found during these surveys were taken from the recent publication by Larson and Johnson, (1999).

STUDY AREA

Mount Rushmore National Memorial is a 1,238-acre park located in Pennington County in the east-central portion of the Black Hills of South Dakota. The park consists of ponderosa pine forests, some of which are in old growth condition, interspersed with stands of aspen, birch, and scrub oak. Several small spring-fed streams and one beaver dam complex occur in the park.

Upon consulting with MRNM natural resource personnel, reviewing the authors past collection records, and conducting a preliminary survey for potential habitats during the first visit, four study sites were selected (Figure 1). Location and description of each site is presented in Table 1. During each sampling period, each site was searched for 15 minutes to 1.5 hours by walking through favorable habitat for butterflies. Length of time spent was determined by success of finding butterflies and size of the site.

RESULTS AND DISCUSSION

A list of butterflies and the numbers observed at each site are presented in Tables 2-5. A total of 39 butterfly species were encountered during the survey (Table 6). Voucher specimens were collected for selected species and have been provided to the Northern Great Plains Inventory & Monitoring Coordinator at MRNM (Table 7).

No threatened or endangered butterfly species presently listed by the U.S. Fish and Wildlife Service are known to occur in South Dakota. Three species – Regal Fritillary (*Speyeria idalia*), Ottoe Skipper (*Hesperia ottoe*), Arogos Skipper (*Atrytone arogos*) - listed as “species of concern” are reported for the Black Hills, (Marrone, 2002); however, none were found during this survey. The probability of finding these species is low because MRNM lacks suitable habitat. Refer to Appendix A for specific details on habitat needs and distribution of these species.

The Clouded Sulphur, Western Pine Elfin, Edwards’ Fritillary, and Common Wood-Nymph were the four most abundant species observed during the survey. All of these species are common to the Black Hills area.

Of the thirteen species listed as rare, the California Tortoiseshell was the most unusual find. Only two historical records existed for South Dakota before this season. The author collected another specimen this year at Badlands National Park (Pennington County) on August 2. Massive population outbreaks periodically occur in the western United States, which may account for the rare strays in South Dakota.

Due to the variability in the size of each area sampled and the length of time spent at each site, caution should be used when making comparisons between sites. In general, butterfly diversity (number of species per site) was greatest at site #1 which had several beaver ponds and abundant nectar sources nearby.

As a note of interest - a wandering garter snake, *Thamnophis elegans*, was seen at site #1 near the beaver pond on July 19. This uncommon snake occurs in South Dakota only in the Black Hills where it inhabits grassy areas near ponds and streams.

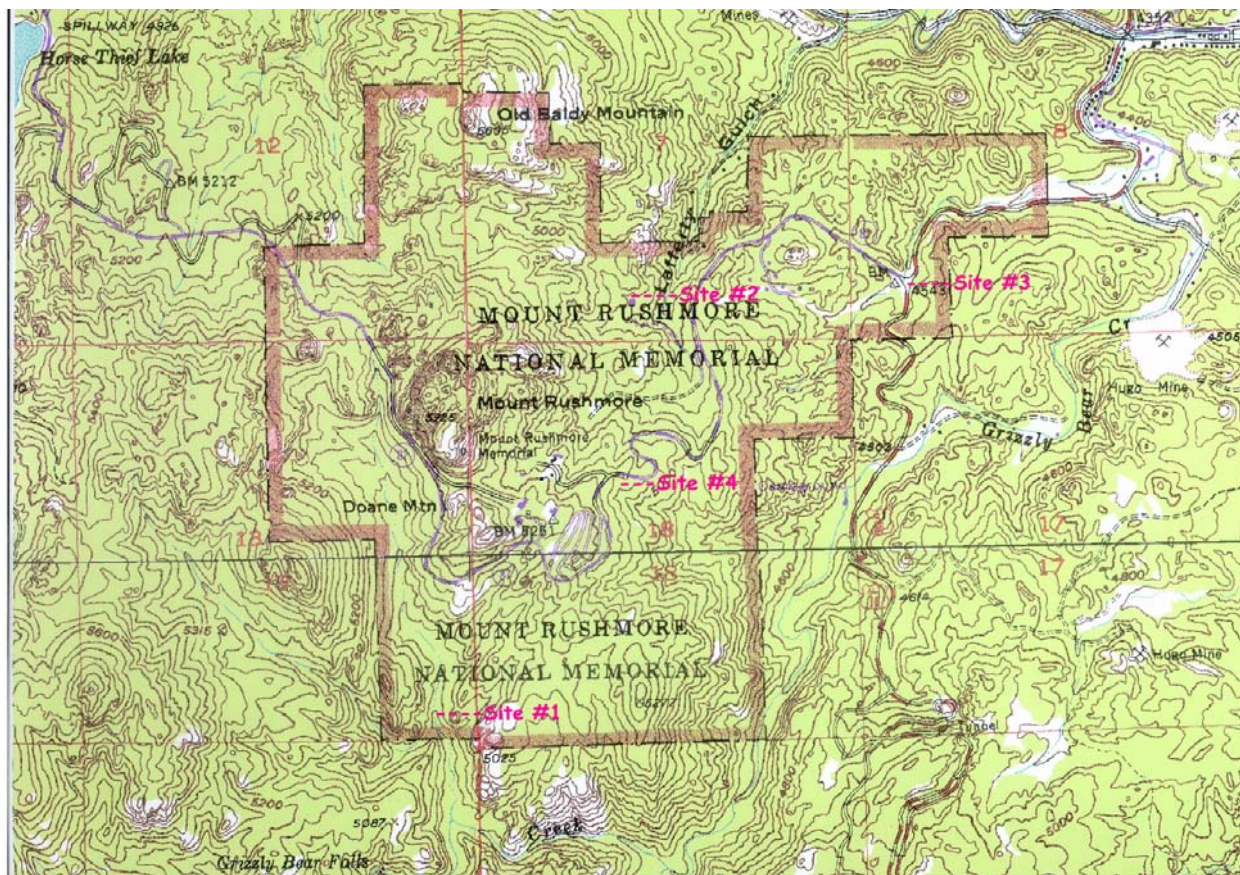


Figure 1. Location of survey sites number 1-4 at Mount Rushmore National Memorial.

Table 1. Location and description of butterfly collection sites at Mount Rushmore National Memorial.

SITE NUMBER	COUNTY	LOCATION	DESCRIPTION	COMMENTS
1	Pennington	T2S,R5E,S13,SE1/4	Old growth ponderosa pine forest area containing spring-fed stream bottom with several old beaver ponds (beaver not present). Other trees in area were Black Hills spruce, scrub oak, birch, aspen, and willow. Hazelnut, ninebark, dogwood, and chokecherry also present. Open areas around beaver ponds provide excellent habitat for many butterfly species.	Forbs in area important to butterflies include golden alexandra, dogbane, thistles, joe-pyeweed, wild bergamot, yellow wood violet, Black-eyed Susan, stonecrop, and longspur violet.
2	Pennington	T2S,R6E,S7,S1/2	Spring within aspen grove and “weedy” disturbed area around equipment storage area. Scrub oak, ponderosa pine, wild raspberry, and ninebark present	Forbs used by butterflies include black-eyed Susan, wild bergamot, fleabane, harebell, goldenrod, pearly everlasting, violets, red clover, mustards, and, dogbane.
3	Pennington	T2S,R6E,S8,SW1/4	Spring along road and open area beneath powerline. Trees include ponderosa pine, scrub oak, birch, aspen, Black Hills spruce, and willow. Red clover, thistles, nettle, vervain, black-eyed Susan, scurfpea, wild bergamot, western snowberry, yellow coneflower, Nuttalls sunflower and the native grass, big bluestem, were present.	Birdsfoot trefoil, a naturalized legume often used for erosion control along roadsides, is common in the northern portion of this area. Native forbs should be planted at these construction sites.
4	Pennington	T2S,R6E,S18	Open disturbed area around large parking lot (helicopter pad). Some of the area may have been planted with native plants, including little bluestem, penstemons, leadplant, and yellow coneflower.	Forbs include yellow sweetclover, wild licorice, Rocky Mountain beeplant, daisy fleabane, vervain, wild mustard, black-eyed Susan, mullein, sunflower, goldenrod, yellow clover, gumweed, and purple clover.

Table 2. List of butterflies found on four survey sites at Mount Rushmore National Memorial during May 27, 2004.

COMMON NAME	SCIENTIFIC NAME	SURVEY SITE NUMBER				TOTAL	COMMENTS
		1	2	3*	4		
Hoary Elfin	<i>Callophrys polia obscura</i>	1				1	
Western Pine Elfin	<i>Callophrys eryphon</i>	11	6			17	nectaring on chokecherry
Western Tailed-Blue	<i>Everes amyntula valeriae</i>		1		1	2	
Spring Azure	<i>Celastrina ladon sidara</i>	7	3			10	nectaring on chokecherry, and wild blackberry
Silvery Blue	<i>Glaucopsyche lygdamus oro</i>	1				1	

* No butterflies observed due to overcast and rainy conditions

Table 3. List of butterflies found on four survey sites at Mount Rushmore National Memorial during June 14, 2004.

COMMON NAME	SCIENTIFIC NAME	SURVEY SITE NUMBER				TOTAL	COMMENTS
		1	2	3	4		
Canadian Tiger Swallowtail	<i>Papilio canadensis</i>	1				1	
Two-tailed Swallowtail	<i>Papilio multicaudatus</i>	3				3	fresh condition
Orange Sulphur	<i>Colias eurytheme</i>	2		3	2	7	
Western Pine Elfin	<i>Callophrys eryphon</i>	10	10			20	
Western Tailed-Blue	<i>Everes amyntula valeriae</i>	1		1		2	
Melissa Blue	<i>Lycaeides melissa</i>	2			1	3	
Variegated Fritillary	<i>Euptoieta claudia</i>		1		1	2	
Edwards' Fritillary	<i>Speyeria edwardsii</i>	20+	20+	20+	20+	80+	common at all sites; nectaring on salsify
Milbert's Tortoiseshell	<i>Nymphalis milberti</i>	1		2		3	
American Lady	<i>Vanessa virginiensis</i>	2			1	3	nectaring on blue flax
Painted Lady	<i>Vanessa cardui</i>	1	1	10	2	14	nectaring on red clover
Silver-spotted Skipper	<i>Epargyreus clarus</i>			2		2	
Northern Cloudywing	<i>Thorybes pylades</i>				2	2	fresh condition
Common Sootywing	<i>Pholisora catullus</i>		2			2	
Common Roadside Skipper	<i>Amblyscirtes vialis</i>			1		1	

Table 4. List of butterflies found on four survey sites at Mount Rushmore National Memorial during July 19, 2004.

COMMON NAME	SCIENTIFIC NAME	SURVEY SITE NUMBER				TOTAL	COMMENTS
		1	2	3	4		
Canadian Tiger Swallowtail	<i>Papilio canadensis</i>	2				2	
Clouded Sulphur	<i>Colias philodice</i>	6		4		10	
Striped Hairstreak	<i>Satyrium liparops aliparops</i>	1				1	female in worn condition
Great Spangled Fritillary	<i>Speyeria cybele</i>		1			1	
Edwards' Fritillary	<i>Speyeria edwardsii</i>	15+	6	4	15+	40+	nectaring on wild bergamot and thistle
Atlantis Fritillary	<i>Speyeria atlantis pahasapa</i>	2				2	
Northwestern Fritillary	<i>Speyeria hesperis lurana</i>		4			4	
Pearl Crescent	<i>Phyciodes tharos</i>	2				2	
Northern Crescent	<i>Phyciodes cocyta</i>	6	2			8	
Gray Comma	<i>Polygonia progne</i>	1	2*			3	*captured in baited butterfly trap
Red Admiral	<i>Vanessa atalanta rubria</i>		1			1	
Weidemeyer's Admiral	<i>Limenitis weidemeyerii oberfoelli</i>		2			2	
Common Wood-Nymph	<i>Cercyonis pegala nephele</i>	6				6	
Silver-spotted Skipper	<i>Epargyreus clarus</i>	2		2	1	5	
Crossline Skipper	<i>Polites origenes rhena</i>	1	1			2	
Taxiles Skipper	<i>Poanes taxiles</i>	2	1			3	fresh condition
Kiowa Skipper	<i>Euphyes vestris kiowah</i>	4				4	

Table 5. List of butterflies found on four survey sites at Mount Rushmore National Memorial during August 15, 2004.*

COMMON NAME	SCIENTIFIC NAME	SURVEY SITE NUMBER				TOTAL	COMMENTS
		1	2	3	4		
Pine White	<i>Neophasia menapia</i>	10+	2			12+	fresh condition, nectaring on joe-pyeweed
Western White	<i>Pontia occidentalis</i>			1		1	female in fresh condition
Clouded Sulphur	<i>Colias philodice</i>	4	1	3	2	10	
Orange Sulphur	<i>Colias eurytheme</i>	1				1	
Variegated Fritillary	<i>Euptoieta claudia</i>	1				1	
Manitoba Fritillary	<i>Speyeria aphrodite manitoba</i>	6				6	
Edwards' Fritillary	<i>Speyeria edwardsii</i>	15+	15+	4	8	42+	common, nectaring on joe-pyeweed
Atlantis Fritillary	<i>Speyeria atlantis pahasapa</i>	1				1	
Northwestern Fritillary	<i>Speyeria hesperis lurana</i>		2			2	
Pearl Crescent	<i>Phyciodes tharos</i>	3				3	
Green Comma	<i>Polygonia faunus hylas</i>	1				1	fresh condition
Hoary Comma	<i>Polygonia gracilis zephyrus</i>	1				1	photographed one individual at site #1
California Tortoiseshell	<i>Nymphalis californica</i>	1				1	worn female, nectaring on joe-pyeweed
Milbert's Tortoiseshell	<i>Nymphalis milberti</i>	1				1	
Red Admiral	<i>Vanessa atalanta rubria</i>		2	1		3	captured in baited butterfly trap
Painted Lady	<i>Vanessa cardui</i>	*				-	* observed larva on thistle
Weidemeyer's Admiral	<i>Limenitis weidemeyerii oberfoelli</i>	6				6	
Common Wood-Nymph	<i>Cercyonis pegala nephele</i>	15+	6	6		27+	common, six captured in butterfly trap
Silver-spotted Skipper	<i>Epargyreus clarus</i>	1				1	
Common Checkered Skipper	<i>Pyrgus communis</i>			1		1	
Kiowa Skipper	<i>Euphyes vestris kiowah</i>	4	2	3		9	

* site # 1 surveyed on Aug. 17.

Table 6. Number and abundance of butterflies found on four sites at Mount Rushmore National Memorial during May 27, June 14, July 19, and August 15 and 17, 2004.

COMMON NAME	SCIENTIFIC NAME	SITE NUMBER				TOTAL / ABUNDANCE*	
		1	2	3	4		
Canadian Tiger Swallowtail	<i>Papilio canadensis</i>	3				3	U
Two-tailed Swallowtail	<i>Papilio multicaudatus</i>	3				3	U
Pine White	<i>Neophasia menapia</i>	10+	2			12+	C
Western White	<i>Pontia occidentalis</i>			1		1	R
Clouded Sulphur	<i>Colias philodice</i>	10	1	7	2	20	A
Orange Sulphur	<i>Colias eurytheme</i>	3		3	2	8	U
Striped Hairstreak	<i>Satyrium liparops aliparops</i>	1				1	R
Hoary Elfin	<i>Callophrys polia obscura</i>	1				1	R
Western Pine Elfin	<i>Callophrys eryphon</i>	21	16			37	A
Western Tailed-Blue	<i>Everes amyntula valeriae</i>	1	1	1	1	4	U
Spring Azure	<i>Celastrina ladon sidara</i>	7	3			10	C
Silvery Blue	<i>Glaucopsyche lygdamus oro</i>	1				1	R
Melissa Blue	<i>Lycaeides melissa</i>	2			1	3	U
Variegated Fritillary	<i>Euptoieta claudia</i>	1	1		1	3	U
Great Spangled Fritillary	<i>Speyeria cybele</i>		1			1	R
Manitoba Fritillary	<i>Speyeria aphrodite manitoba</i>	6				6	U
Edwards' Fritillary	<i>Speyeria edwardsii</i>	50+	41+	28+	43+	162+	A
Atlantis Fritillary	<i>Speyeria atlantis pahasapa</i>	3				3	U
Northwestern Fritillary	<i>Speyeria hesperis lurana</i>		6			6	U
Pearl Crescent	<i>Phyciodes tharos</i>	5				5	U
Northern Crescent	<i>Phyciodes cocyta</i>	6	2			8	U
Green Comma	<i>Polygonia faunus hylas</i>	2				2	R
Hoary Comma	<i>Polygonia gracilis zephyrus</i>	1				1	R
Gray Comma	<i>Polygonia progne</i>	1	2			3	U
California Tortoiseshell	<i>Nymphalis californica</i>	1				1	R
Milbert's Tortoiseshell	<i>Nymphalis milberti</i>	2		2		4	U
Red Admiral	<i>Vanessa atalanta rubria</i>		3	1		4	U
American Lady	<i>Vanessa virginiensis</i>	2			1	3	U
Painted Lady	<i>Vanessa cardui</i>	1	1	10	2	14	C
Weidemeyer's Admiral	<i>Limenitis weidemeyerii oberfoelli</i>	6	2			8	U
Common Wood-Nymph	<i>Cercyonis pegala nephele</i>	21+	6	6		33+	A
Silver-spotted Skipper	<i>Epargyreus clarus</i>	3		4	1	8	U
Northern Cloudywing	<i>Thorybes pylades</i>				2	2	R
Common Checkered Skipper	<i>Pyrgus communis</i>			1		1	R
Common Sootywing	<i>Pholisora catullus</i>		2			2	R
Crossline Skipper	<i>Polites origenes rhena</i>	1	1			2	R
Taxiles Skipper	<i>Poanes taxiles</i>	2	1			3	U
Kiowa Skipper	<i>Euphyes vestris kiowah</i>	8	2	3		13	C
Common Roadside Skipper	<i>Amblyscirtes vialis</i>			1		1	R
TOTAL SPECIES/SITE		30	18	13	10	39	R – 12 U – 19 C – 4 A – 4

*R = Rare (< 3)

U = Uncommon (3-8)

C = Common (9-14)

A = Abundant (>14)

Table 7. List of butterfly vouchers collected by the author at Mount Rushmore National Memorial.

COMMON NAME	SCIENTIFIC NAME	LOCATION	HABITAT	DATE	COMMENTS
Pine White	<i>Neophasia menapia</i>	T2S,R5E,S13,SE1/4	edge of ponderosa pine forest	17 Aug. 2004	nectaring on joe-pyeweed; 1 male, 2 females
Western White	<i>Pontia occidentalis</i>	T2S,R6E,S8,SW1/4	open disturbed area	15 Aug. 2004	female; specimen darker than normal
Striped Hairstreak	<i>Satyrrium liparops aliparops</i>	T2S,R5E,S13,SE1/4	near beaver pond	19 July 2004	worn female
Hoary Elfin	<i>Callophrys polia obscura</i>	T2S,R5E,S13,SE1/4	near beaver pond	27 May 2004	
Western Pine Elfin	<i>Callophrys eryphon</i>	T2S,R5E,S13,SE1/4	near beaver pond	27 May 2004	nectaring on chokecherry; 1 male, 1 female
Spring Azure	<i>Celastrina ladon sidara</i>	T2S,R5E,S13,SE1/4	near beaver pond	27 May 2004	nectaring on chokecherry; male
Great Spangled Fritillary	<i>Speyeria cybele</i>	T2S,R6E,S7,S1/2	open disturbed area	19 July 2004	male
Edwards' Fritillary	<i>Speyeria edwardsii</i>	T2S,R5E,S13,SE1/4	near beaver pond	14 June 2004	fresh female
Atlantis Fritillary	<i>Speyeria atlantis pahasapa</i>	T2S,R5E,S13,SE1/4	near beaver pond	19 July 2004	2 males
Northwestern Fritillary	<i>Speyeria hesperis luraana</i>	T2S,R6E,S7,S1/2	open disturbed area	19 July 2004	male
Northern Crescent	<i>Phyciodes cocyta</i>	T2S,R5E,S13,SE1/4	near beaver pond	19 July 2004	male
Green Comma	<i>Polygonia faunus hylas</i>	T2S,R5E,S13,SE1/4	near beaver pond	17 Aug. 2004	fresh condition
Gray Comma	<i>Polygonia progne</i>	T2S,R6E,S7,S1/2	aspen grove	19 July 2004	captured in baited butterfly trap
California Tortoiseshell	<i>Nymphalis californica</i>	T2S,R5E,S13,SE1/4	near beaver pond	15 Aug. 2004	nectaring on joe-pyeweed, specimen worn
American Lady	<i>Vanessa virginiensis</i>	T2S,R6E,S18	open disturbed area	14 June 2004	nectaring on blue flax
Painted Lady	<i>Vanessa cardui</i>	T2S,R6E,S8,SW1/4	open area near spring	14 June 2004	nectaring on red clover
Northern Cloudywing	<i>Thorybes pylades</i>	T2S,R6E,S18	open disturbed area	14 June 2004	fresh condition
Crossline Skipper	<i>Polites origenes rhena</i>	T2S,R5E,S13,SE1/4	edge of ponderosa pine forest	19 July 2004	fresh condition; 1 male, 1 female
Taxiles Skipper	<i>Poanes taxiles</i>	T2S,R5E,S13,SE1/4	near beaver pond	19 July 2004	fresh condition; 1 male, 1 female
Common Roadside Skipper	<i>Amblyscirtes vialis</i>	T2S,R6E,S8,SW1/4	open area near spring	14 June 2004	

MANAGEMENT ISSUES AND RECOMMENDATIONS TO PARK MANAGEMENT

1. **Management for ecosystem biodiversity would greatly benefit all native butterfly species.** Native habitats important to butterflies should be protected and/or enhanced, especially at water sources such as springs and streams. Moffat and McPhillips (1993) discuss several management methods, including controlled burns, mowing, and grazing, specific for prairie endemic butterfly species that would be applicable to MRNM.
2. Invasion of non-native grasses, particularly smooth brome grass, into native habitats should be prevented. This problem is especially evident at site #3 at junction of U.S. Hwy. 16A and SD Hwy. 244. Birdsfoot trefoil at site #3 has also become aggressive and this introduced legume is crowding out native plants. A prescribed burn conducted in this small area would enhance plant species diversity and may help control these two exotics.
3. Most butterflies inhabit sunny areas such as meadows. Larger open areas, especially around the springs and beaver ponds, should be created to provide habitat for flowering forbs. This may require the removal of some ponderosa pine and aspen trees along the old road grade at Site #2 (Water Treatment Plant) and adjacent to the ponds at Site #1 (Beaver Ponds). The open area below the powerline at Site #3 should be increased to create a small meadow.
4. The success of native plant re-introductions at Site #4 (Parking Lot and Helicopter Pad) should be monitored. Areas disturbed by new road construction or other development projects should be restored with grasses, wild flowers, and shrubs native to the area.
5. Native wildflower plantings (butterfly gardens) along the entrance and sidewalks to MRNM would benefit and attract many local butterfly species. Visitors would be provided an opportunity to learn about some of the local wildflowers and butterflies inhabiting the Black Hills. Volunteers may be willing to maintain the gardens at little or no cost to the Park Service.
6. Periodically (at least once in every 4 years) monitor butterfly abundance and diversity.
7. Comments and recommendations specific to each site include:

(A). Site #1 (Beaver Ponds) -- Thirty butterfly species were found at this diverse area, of which ten were exclusive to this site alone. Trampling by horses used by trail riders is causing some minor erosion along pond and stream banks.



Photo 1. Photo of a beaver pond and the associated wetland plant community at site #1. Lower insets show two butterflies found at this area -- a Weidemeyer's Admiral (left) sipping moisture from mud and a Hoary Comma (right) basking in the sun.

(B). Site #2 (Water Treatment Plant) – Maintain/enhance the open areas adjacent to the spring-fed stream. Removal of ponderosa pine and aspen trees along the old road grade on the south side of the water treatment compound fence would create an open meadow-like area that would benefit butterflies.



Photo 2. Photo of spring-fed stream area at Water Treatment site #2. Inset is a female Common Wood-Nymph perching on an aspen tree.

(C). Site #3 (Junction of U.S. Hwy. 16A and SD Hwy. 244) – Smooth brome grass and birdsfoot trefoil are invading some of this site. A small prescribed burn may benefit the native plants in this area.



Photo 3. Photo of site #3 showing rock outcropping and the abundance of ox-eye daisy and other flowers.



Photo 4. Photo shows abundance of birdsfoot trefoil at north end of site #4.

(D). Site #4 (Parking Lot/Helicopter Pad) – no photo available for area. This small site, disturbed by past human activity, has a diversity of “weedy plants” including curlycup gumweed, mullein, and wild mustard. However, the presence of little bluestem, penstemons, leadplant, and coneflowers indicate that a portion of the area adjacent to the concrete parking lot has been “re-seeded” with native forbs and grasses. In time this area should provide good habitat for many of the local butterflies.

ACKNOWLEDGMENTS

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LITERATURE CITED

Larson, G.E., and J.R. Johnson. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University, Brookings: SDAES Bulletin 732. 617 pp.

Marrone, G.M. 2002a. Field Guide to Butterflies of South Dakota. South Dakota Dept. of Game, Fish and Parks. 478 pp.

Moffat, M., and N. McPhillips. 1993. Management for Butterflies in the Northern Great Plains: A Literature Review and Guidebook for Land Managers. U.S. Fish & Wildlife Service, Washington D.C. 19 pp.

Opler, P.A., and A.B. Wright. 1998. A Field Guide to Western Butterflies. Houghton Mifflin Company, Boston and New York. xiv + 540 pp.

Royer, R.A., J.E. Austin, and W.E. Newton. 1998. Checklist and "Pollard Walk" Butterfly Survey Methods on Public Lands. Am. Midl. Nat. 140:358-371.

Appendix A. A brief synopsis of each targeted species:

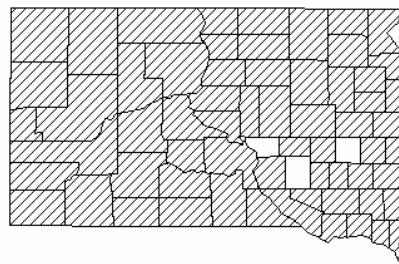
Regal Fritillary

Speyeria idalia

Description: Wingspan: 2.9-3.8 inches. Females are larger and darker than males. The upperside of the forewing is reddish orange with black and white spots. Hindwings are velvety black with two rows of spots; both rows of spots are cream-colored in the female, outer row rust-orange in the male. The underside of the hindwing is brown with large silver spots.

Similar Species: Only large fritillary in South Dakota with black hindwings.

Distribution and Habitat: Historical range extended from New England to North Carolina and westward to eastern Colorado, Wyoming, and southeastern Montana. No longer occurs in much of New England and rapidly declining over much of its range except the prairie states. Common in northeastern South Dakota in tall-grass prairie sites near marshes, undisturbed mixed-grass prairie areas along Missouri River breaks, and the Fort Pierre National Grassland. Generally restricted to areas of the state where sufficient native grasslands exist.



Early Stages: The caterpillar is yellowish brown with black markings and yellowish bands; black dorsal spines have silvery white bases.

Larval Host Plants: Various species of violets, including prairie violet and Nuttall's violet.

Adult Energy Sources: Nectar from a wide variety of flowers, including purple coneflower, gayfeather, hoary vervain, thistles, wild bergamot, alfalfa, and milkweeds. Whorled milkweed, near Oahe Dam in Stanley County, was noted to be a favored nectar source in 1983.

Flight Period: One brood, with flight dates ranging from June 12 to September 16. Males appear in mid-June and fly until August; female flight period is early July to mid-September. After hatching, the unfed caterpillar overwinters on the ground beneath leaves.

General Comments: Population size seems to fluctuate from year to year. Large tracts of native prairie with abundant wildflowers, such as Samuel Ordway Prairie managed by The Nature Conservancy near Leola, S.D., are needed to protect this species from further decline. The South Dakota Natural Heritage Program is currently monitoring this species.

Special References: Kelly, L., and D.M. Debinski. 1998. Relationship of host plant density to size and abundance of the Regal Fritillary *Speyeria idalia* Drury (Nymphalidae). J. Lepid. Soc. 52(3):262-276.

Royer, R.A., and G.M. Marrone. 1992. Conservation status of the Regal Fritillary (*Speyeria idalia*) in North and South Dakota. A report to the U.S. Dept. of Interior, U.S. Fish and Wildlife Service, Denver, CO.

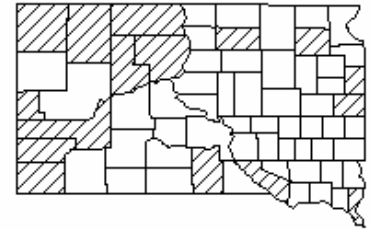
Ottoe Skipper

Hesperia ottoe

Description: Wingspan: 1.20-1.55 inches. Uppersides are bright orange. Males have narrow diffuse dark borders and a black stigma in the forewing that contains gray-brown scales. The female has wider more diffuse dark borders and several yellowish white spots in the forewing. The underside of the hindwing is pale orange with no markings in the male and occasionally a faint row of spots in the female.

Similar Species: Pawnee Skipper flies in August-September, and the male has yellow scales in the stigma. Dakota Skipper is smaller with darker undersides.

Distribution and Habitat: Very local and generally uncommon to rare throughout South Dakota and its entire range. Found in scattered, relatively undisturbed, mixed-grass to tall-grass prairie sites such as the area below Fort Randall Dam, Charles Mix County, and the Crystal Springs Preserve, managed by The Nature Conservancy, near Clear Lake, Deuel County.



Early Stages: The caterpillar is greenish brown; head dark brown.

Larval Host Plants: Native prairie grasses, including little bluestem, big bluestem, and sideoats grama.

Adult Energy Sources: Nectar from many flowers, but especially those of coneflowers, gayfeathers, asters, milkweeds, alfalfa, leadplant, black-eyed Susan, and sunflowers.

Flight Period: One brood from late June to August with peak flight in mid-July; dates extend from June 23 to August 4. Overwinters as a partially grown caterpillar in a leaf shelter.

General Comments: Males perch on tall flowers such as purple coneflowers and thistles to watch for females. The South Dakota Natural Heritage Program monitors the Ottoe Skipper. Native prairie sites with abundant nectar sources need protection in order for this species to survive.

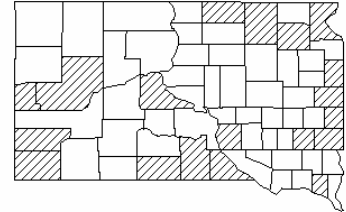
Arogos Skipper

Atrytone arogos

Description: Wingspan: 1.10-1.25 inches. Uppersides are yellow-orange with wide dark borders. The female has broader dark wing margins that diffuse into, and nearly cover over, the orange in the hindwing. Males lack a stigma. The underside of the hindwing is golden yellow with pale veins.

Similar Species: Delaware Skipper is brighter orange and has a more distinct border and dark veins.

Distribution and Habitat: Local and occasionally common throughout South Dakota but may be absent from northwestern corner. Found in relatively undisturbed prairies and grasslands such as Mirror Lake Game Production Area, Lawrence County, and South Scalp Creek Recreation Area, near Fort Randall Dam, Gregory County.



Early Stages: The caterpillar is light green with a dark green dorsal stripe; head gray with orange streaks.

Larval Host Plants: Big bluestem and little bluestem. Caterpillars feed on leaves and live in nests constructed of two leaves sewn together with silk.

Adult Energy Sources: Purple coneflower, prairie coneflower, blackeyed Susan, and thistles.

Flight Period: One brood with peak flight in July; dates extend from June 25 to July 26. Overwinters as a partially grown caterpillar in a leaf cocoon about three feet above the ground.

General Comments: Males perch near host plants in mid-afternoon to watch for females. The South Dakota Natural Heritage Program is currently monitoring this species.

Special References: Royer, R.A., and G.M. Marrone. 1992. Conservation status of the Arogos Skipper (*Atrytone arogos*) in North and South Dakota. A report to the U.S. Dept. of the Interior, U.S. Fish and Wildlife Service, Denver, CO.